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Leaf size in plant geography.—RAUNKIAER,[4] whose name is associated with the system of biological types or life forms, has recently submitted another means of quantitative estimation, so far as the unit chosen is a recorder of the biological value of a climate. He regards the size of the leaf as the outstanding character, and using the simple leaf as a standard, has proposed a system of leaf classes (Bladstørrelsesklasser). In the plan submitted there are 6 different classes or divisions: (1) leptophyll, 25 sq. mm.; (2) nanophyll, $9 \times 25 = 225$ sq. mm.; (3) microphyll, $9^2 \times 25 = 2025$ sq. mm.; (4) mesophyll, $9^3 \times 25 = 18225$ sq. mm.; (5) macrophyll, $9^4 \times 25 = 164025$ sq. mm.; (6) megaphyll, which is limited by the upper limit of macrophylls. Originally he planned to use the number 10 with 25, but from a large number of trials, both by himself and several of his colleagues, 9 was found to give a better differentiation. In using 9, it is easy to make subdivisions, large, medium, and small, if desired. RAUNKIAER is of the opinion that it is an easy matter to place the various leaves in their right classes, but in order to facilitate matters, a graphical representation of the various limits of surface area is pictured, and by the use of this scheme the leaves may be correctly grouped. Thus, if a leaf has an area which is less than 25 sq. mm., it is a leptophyll; if larger than 25 sq. mm. but smaller than 225 sq. mm., it is a nanophyll, and so on.

In using such a method, RAUNKIAER contends that it is possible to obtain the biological factor for climate as far as it influences leaf size. By the use of such a scheme, comparisons may be made readily between two climates which have varying effects. One may compare formations which vary at different points, and also determine the relation between a series of associations which are somewhat similar. To prove his point he has selected and analyzed several European evergreen shrub formations.

He suggests that the leaf "size classes" are not the only quantitative units to be employed, but shows that these units lend themselves rather readily to the statistical method. A system which would in some way estimate such structural features as stomatal protection, stomatal opening, or hairiness, would also give significant results. The difficulties would naturally be many, but they should not hinder the attempt.

Ecologists and physiologists no doubt will be in hearty sympathy with RAUNKIAER's move in placing ecology upon a basis that is at least somewhat quantitative. We all are in accord with his concluding sentence (translated somewhat literally): "by such means only will it be possible to pass beyond the tourist plant geographer's superficial and vague determinations."—A. L. BAKKE.

Mountain grassland.—Many of the valleys of the Colorado Rocky Mountains have their comparatively level floors covered with grasslands of somewhat varied types, presenting ecological problems of peculiar interest. The more xerophytic type of such grassland has been studied in South Boulder Park by RAMALEY[5] and by him designated "dry grasslands" in contrast to the more mesophytic "meadow." One of the most interesting problems of the park is the relationship of these two phases of grassland, and one must regret that it has been so slightly touched upon in the present paper. Another deficiency is the limited number of data regarding the environmental factors. Some soil moisture studies seem to show that the growth water is not abundant in any association, although unfortunately the relationship of the soils of which wilting coefficient determinations were made and those whose water content were studied is not clearly apparent. Wilting coefficients ranging from 3.5 to 7.6 indicate to some extent the coarse texture and low water-retaining power of the soil which, combined with such climatic factors as short summers, high winds, and an annual rainfall of 28 inches, tend to retard the development of mesophytic vegetation.

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[4] RAUNKIAER, C., Om Bladstørrelsens Anvendelse i den biologiske Plantegeografi. Botanisk Tidsskrift **34**:225–240. 1916.

A most interesting seasonal succession is described, ranging from a prevernal period extending from May 1 to June 15 and characterized by the blooming of *Mertensia Bakeri* and *Thlaspi purpurascens*, through well marked vernal, early and late aestival, to an autumnal in which the bloom is almost entirely limited to late grasses and blue gentian.

The series of associations involved in the xerarch succession here in progress proceeds from one characterized by *Erigeron multifidus* and *Selaginella densa* on recently exposed soil, through others in which *Carex stenophylla* associated with certain Leguminosae and Compositae such as *Aragallus Lambertii* and *Chrysopsis villosa* gradually give place to others in which grasses become increasingly abundant and important. The author regards the ultimate grassland vegetation as an association in which the grasses represented by species of *Muhlenbergia*, *Danthonia*, *Poa*, and *Festuca* predominate. Whether this will pass eventually to the more mesophytic meadow, and it in turn be replaced by forest, seems at present to be a probability not demonstrated. In spite of this and other unsolved problems, the present discussion, together with the careful analyses of the same author[6] previously published, very greatly advances our knowledge of these interesting grasslands.—GEO. D. FULLER.

Taxonomic notes.—BERRY[7] has described a new species of *Zamia* (*Z. mississippiensis*) from the Lower Eocene of Missisippi. It has "slender, graceful leaves and much reduced pinnules suggestive of *Z. floridana*."

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[5] RAMALEY, F., Dry grasslands of high mountain park in northern Colorado. Plant World **19**:249–270. *figs. 6.* 1916.

[6] ———, The relative importance of different species in a mountain grass-land. BOT. GAZ. **60**:154–157. 1915.

———, Quadrat studies in mountain grassland. BOT. GAZ. **62**:70–74. 1916.

[7] BERRY, E. W., A *Zamia* from the Lower Eocene. Torreya **16**:177–179. *figs. 3.* 1916.